

Land-Cover Changes in a River Valley in Blue Earth County, Minnesota, 1938 - 1974

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ABSTRACT—The boundary of the Blue Earth River Valley was determined by stereoscopic viewing of 1938-39 aerial photographs. The same boundary was then drawn on corresponding 1974 photographs. All area within the river valley was assigned to one of four land-cover. Comparison of 1938-39 to 1974 shows a decrease of 19 percent in river area, an increase of one percent in row crop area, an increase of 52 percent in tree area, and a decrease of 45 percent in scrub area.

For centuries rivers and river valleys have been the focus of use for transportation routes, for croplands, for towns and cities. In recent years in the United States and in Minnesota a growing population has led to increased pressure on all land for residential, agricultural and recreational development. The impact of this pressure can be observed in Minnesota in numerous subdivisions, in the drainage of wetlands and in numerous subdivisions, in the drainage of wetlands and in the proliferation of water-side vacation homes; but has it led to significant land-cover changes in the river valleys? Data on such changes does not yield specific information on the causes of change or on its effect on environmental quality. It does, however, indicate areas as a starting point for further investigation. This study examined the land-cover of one river valley in a predominately rural county of southern Minnesota over a forty-year time span.

Aerial photographs utilized

Aerial photographs used by the Soil Conservation Service of the United States Department of Agriculture (USDA) were obtained. Also, 1938-39 BIP series photographs were obtained from the Mankato State University Department of Geography and 1974 photographs from the Mankato area Soil Conservation Service office. Photographs were chosen and marked so that the entire river valley was covered without overlap from the Blue Earth-Faribault County line to a point near the confluence of the Blue Earth and Watonwan Rivers. The river valley here was considered to include the valley bottom and the often steep-sloped sides. The river valley boundary was determined by stereoscopic viewing of the 1938-39 photographs. This same boundary was then drawn on the corresponding 1974 photographs.

All area within the river valley was assigned to one of four land-cover categories: river, row crops, trees, and scrub or other. River included the water-filled channel itself as well as barren islands and shores. Oxbow lakes and the larger vegetated islands were not considered in this category. Row crops included cleared, plowed and planted fields regardless of crop. No attempt was made to distinguish between cleared non-brushy fields used for pastures or fallow and those used for cash crops. Trees included areas of dense and complete tree cover. The presence or absence of understory was not determined. The category "scrub or other" included sparsely treed, brushy areas and other areas of substantial size not included in previous categories. Areas of less than ten acres, roads, oxbow lakes, homesteads and other discontinuities

Table I — Land-Cover (Acres) in the Blue Earth River Valley

	1938-39	1974	% Change
River	3,993	3,244	19% loss
Row Crops	19,487	19,682	1% gain
Trees	10,277	15,654	52% gain
Scrub or Other	9,398	5,179	45% loss
Total River Valley	43,151	43,156	

were not separated out. It was usually appropriate to consider them part of the adjoining or surrounding category.

Some areas presented interpretive problems: how dense are the trees, how scrubby is the field, is the flooded area cleared or brushy? These problems were encountered mostly on the 1938-39 photographs. These photographs were smaller scale (nominally 1:20,000 as opposed to 1:15,840), smaller format (9"x9" as opposed to 21"x21") and of more varying quality than the 1974 photographs. In addition, the 1938-39 photographs were taken on four different dates over a one-year period; while the 1974 photographs were all made on one day.

All area measurements were made with a LASICO digital planimeter. All areas were triple measured and averaged.

Increase in Woodlands Found

A comparison of 1938-39 and 1974 shows a decrease of 19 percent in river area, an increase of one percent in row crop area, an increase of 52 percent in tree area and a decrease of 45 percent in scrub area (Table I).

The decrease in river area may reflect the different scales, qualities and marking devices used rather than a real change in river area. Of the 1938-39 photographs, 25 percent were taken during flood or high water periods, and half of the remaining photographs were taken when the fields were very wet. All of the 1974 photographs were taken under drier conditions. No substantial straightening or other shortening of the river course was seen.

The absence of substantial change in the row crop area indicates that by the 1930's this river valley was already cleared and cropped to the extent it was in 1974. Although in the state and region the drainage of wetlands, especially since the 1950's, has brought new land into agricultural production, this does not seem to have affected the amount of cropland in the Blue Earth River valley. Some marginal lands are currently being cropped, areas where corn growing is causing erosion and siltation problems. Further increases in cropland though would probably be limited by soil capabilities, slope problems and the character of the water table.

The decrease in "scrub or other" primarily reflects a change in the amount of scrub area. Residential areas, roads with

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Table II – U.S. Agricultural Census
Blue Earth County, Minnesota

	1939	1974	% Change
Land in Farms as percent	458,070 96.7	414,077 87.9	10% decrease
Farm Size	145.9	257	76% increase
Land in Farms According to Use:			
Total Cropland	362,158	349,176	4% decrease
Total Woodland	22,615	23,187	3% increase
Other Land	73,297	41,714	43% decrease
Farm Inventory:			
Horses & Mules	11,006	288	97% decrease
Cows & Calves	48,907	32,862	33% decrease
Dairy Cows	26,182	3,522	87% decrease
Beef Cows	2,332	7,322	214% increase
Hogs & Pigs	54,374	80,401	48% increase
Sheep	15,406	8,641	44% decrease

wide right of ways or interchanges and commercial or industrial areas accounted for a negligible amount of this category in both sets of photographs. Further north in the Blue Earth Valley between Rapidan and Mankato this would not be the case. Residential development in this segment of the river valley would make it advisable to add a category of "built-up area." The flood plain area of the river valley is protected from future residential, commercial and to some extent industrial development by the state Floor Plain Management Act of 1969. But where the river valley is wide, there is terrain outside the flood plain which can be developed.

For this section of the Blue Earth River valley, however, the decrease in this category reflects a decrease in the amount of scrubby area. The push during and just after World War I to increase agricultural production may have led to the clearing and cultivation of additional river valley lands that proved to be unsuited to long-term agricultural use. These agriculturally marginal lands may have been dropped from production in the 1920's and 1930's, so that in the 1938-39 photographs these former fields would have been returning to forest. Regardless of the original cause of these scrubby areas, they may be returning in a direct and orderly succession to the climax forest of the river bottom or they may be maintained as scrub area for an indefinite period by the grazing of livestock. From this study it is not possible to determine the extent of grazing.

The increase in the treed area seems to reflect numerous scrub areas that have matured. Cleared or scrubby fields can be maintained in that condition by the proper grazing of livestock. The increasing specialization in agriculture has meant more corn and soybeans and less livestock, or in a livestock operation more confinement of the animals and less grazing. This decrease in livestock or livestock grazing, especially since the 1950's, would allow the scrub areas to continue growing toward the river bottom climax forest. There have been no programs in the past 20 years to promote actively an increase in tree stands.

Agricultural Census Information

A direct comparison of these measurements to other existing statistics is difficult and inferences must be drawn carefully. One set of existing statistics is the United States Agricultural Census (Table II). Since 1900 this census has gathered land-use information at 5 and 10 year intervals using some categories comparable to those used in this study. The census information is for land-use on farm land only, but in Blue Earth County that includes most of the county area. The study area is, however, only about 10 percent of the county. More importantly, the river valley is not representative of the county, notably in terms of terrain and land-cover. So although the information categories are similar, the areas covered are not specifically comparable.

The census figures show some interesting possibilities, though. The decrease in large livestock grazing supports the possibility that a reduction in grazing has played a role in the decrease in scrub land. The special problems and conditions of the river valley itself may account for any unused grazing lands being returned to woodland and not being converted into residential or cultivated property.

This study found significant changes in the amount of scrub and wooded land, no significant change in the amount of residential and cultivated land. The causes of these changes, their relation to county and state wide trends and their effect on environmental quality are areas for further investigation.

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